

About mRNA COVID-19 Vaccines

Background Information for Healthcare Providers

The first two COVID-19 vaccines authorized for use in the United States are what is known as messenger RNA vaccines—also called “mRNA” vaccines.

You and your patients may have questions about how mRNA vaccines work and how safe they are.

On this page, the Centers for Disease Control and Prevention (CDC) provides information on mRNA technology and mRNA vaccines. Like all vaccines, these COVID-19 mRNA vaccines were tested rigorously for safety before being authorized for use in the United States.

3 Key Things to Know

1. mRNA technology is new, but not unknown. It has been studied for decades.
2. mRNA vaccines do not contain live virus and carry no risk of causing disease in the vaccinated person.
3. mRNA from the vaccine never enters the nucleus of the cell and does not affect or interact with a person’s DNA.

mRNA Approach to Vaccines



mRNA vaccines take advantage of the process that cells use to make proteins to trigger an immune response and build immunity to SARS-CoV-2, the virus that causes COVID-19.

In contrast, most vaccines use weakened or inactivated versions or components of the disease-causing pathogen to stimulate the body’s immune response to create antibodies.

Mechanism for Action



mRNA vaccines have strands of messenger RNA inside a special coating. That coating protects the mRNA from enzymes in the body that would otherwise break it down. The coating also helps the mRNA enter the muscle cells near the vaccination site.

mRNA vaccines tell our cells to make a piece of the “spike protein” that is found on the surface of the SARS-CoV-2 virus. Since only part of the protein is made, it does not harm the vaccine recipient, but it is antigenic and thus stimulates the immune system to make antibodies.

After the piece of the spike protein is made, the cell breaks down the mRNA strand and disposes of it using enzymes in the cell. As stated above, the mRNA strand never enters the cell’s nucleus or affects the vaccine recipient’s genetic material. Knowing this helps you respond to misinformation about how mRNA vaccines alter or modify someone’s genetic makeup.

Once displayed on the cell surface, the protein or antigen causes the immune system to begin producing antibodies. These antibodies are specific to the SARS-CoV-2 virus spike protein, which means the immune system is ready to protect against future infection.

Continuous and Rigorous Safety Assessment



These COVID-19 mRNA vaccines went through the same rigorous safety assessment as all vaccines do before the Food and Drug Administration authorizes them for use in the United States. This included large clinical trials and data review by a safety monitoring board.

Often, patients are concerned about live vaccines. mRNA vaccines are not live vaccines and do not use an infectious element, so they carry no risk of causing disease in the vaccinated person.

Decades of Research



mRNA vaccines have been studied for influenza, Zika, rabies, and cytomegalovirus (CMV).

Recent technological advancements in RNA biology and chemistry, as well as delivery systems, have mitigated the challenges of these vaccines and improved their stability and effectiveness.

Beyond vaccines, numerous preclinical and clinical studies have used mRNA to encode cancer antigens to stimulate immune responses targeted at clearing or reducing malignant tumors.

Benefits of mRNA Vaccines



mRNA vaccines have several benefits compared to other types of vaccines, including use of a non-infectious element, shorter manufacturing times, and potential for targeting multiple diseases.

mRNA vaccines can be developed in a laboratory using readily available materials. This means the process can be standardized and scaled up, making vaccine development faster than traditional methods. In the future, mRNA vaccine technology may allow for one vaccine to target multiple diseases.

Related Links:

- [Talking to Patients about COVID-19 Vaccines](#)
- [Patient Information: Understanding mRNA Vaccines](#)
- [FDA's Vaccine Development 101](#)
- [FDA's Emergency Use Authorization for Vaccines Explained](#)
- [FDA Infographic: The Path for a COVID-19 Vaccine from Research to Emergency Use Authorization](#)

Additional Resources:

- Pardi N, Hogan MJ, Porter FW, Weissman D. [mRNA Vaccines—a New Era in Vaccinology](#) . *Nature Reviews. Drug Discovery*. 2018;17(4):261.
- Maruggi G, Zhang C, Li J, Ulmer JB, Yu D. [mRNA as a Transformative Technology for Vaccine Development to Control Infectious Diseases](#) . *Molecular Therapy*. 2019;27(4):757–72.
- Jackson NAC, Kester KE, Casimiro D, Gurunathan S, DeRosa F. [The Promise of mRNA Vaccines: A Biotech and Industrial Perspective](#) . *Npj Vaccines*. 2020;5(1):1–6.